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RETARDING EFFECT OF MOISTURE, DUST, ETC., UPON RAILROAD TRAINS.

The general principle, that all foreign substances interposed between the wheels of a train of cars and the rails, diminish the velocity, by an increase of resistance, has long been established. The component effect resulting from the opposite action of such substances upon the drivers and running wheels, has not however been made, as far as we are aware, the subject of exact experiment, and yet no mere accidental circumstance has more influence than what is commonly referred to as the "state of the rails." It no doubt has frequently occurred to those of the profession who have reflected upon this subject, that beneficial results would follow an investigation into the law and causes of the state of surface of rails and wheels. At the risk of appearing tedious upon so simple a matter, we will endeavor to recapitulate the data upon which such investigations must be founded.

The whole theory of locomotion upon railroads is founded upon two fundamental propositions, viz: 1st. That a wheel carriage requires less force to draw it, as the surface upon which it moves is rendered smoother, or in other words, as the rolling friction is diminished. 2nd. That upon any ordinary surface, suitable for moving carriages, this rolling friction, however diminished, is still great enough to allow a machine, revolving its own wheels, to advance, and even to carry other carriages with it. The rolling friction in this case is called the adhesion, and in fact is the propelling force. The truth of this last proposition, it is well known, was strangely enough overlooked, until after railroads had been many years in use.

Friction is, then, the cause of the propulsion of locomotives, and

at the same time the limit of their power. Let us suppose the possibility of annihilating the friction betweon the rail and wheels. The drivers of an engine would in this case "slip," that is, would revolve without impelling the machine itself—on the other hand, the wheels of the cars would offer no resistance, and the slightest force would be sufficient to draw a train upon a level. The presence of friction to the slightest amount, would allow the engine to move, but would increase the resistance of the train. Experience soon taught the makers of engines that the rolling friction, or adhesion of the drivers, must be increased, and the most evident method of accomplishing this was to increase the weight of the engine, and next followed the various contrivances for throwing the weight of the tender upon the engine, and as much of both, as possible, upon the drivers.

The superiority of wrought iron over cast iron for tires or wheels led to the adoption of that material for drivers and even for car wheels. There was also supposed to be an advantage attendant upon this practice, in accordance with the law that the friction of like substances was greater than that between dissimilar surfaces. The truth of this law, in the particular case before us, is rendered doubtful by experiments on friction of high authority.

The next improvement in car wheels was the introduction of what are called chilled wheels. These insure a two-fold purpose, they wear far better than ordinary cast iron wheels, and diminish the resistance probably from the greater regularity of their surfaces, and the peculiar structure given to the metal.

Let us now consider the effect of introducing a third substance. When a locomotive has from any cause become unable to procure sufficient adhesion to the rails, a very common practice is to throw sand under the drivers, and an engine is thus enabled to proceed, which would otherwise be unequal to the task. So great is the advantage supposed to be gained by this practice that a contrivance has been attached to engines for the purpose of sprinkling sand before the wheels. We are unable to say how extensively this has been adopted, but as it is used and has been highly recommended, it may not be improper to point out all the bad consequences likely to result from its adoption. The obvious reason for the employment of sand, is the increased adhesion, but this is only attained by interposing a greater friction, which ends in injuring the rails and finally diminishing the ease with which a load may be drawn, for every time a grain of sand is pressed between the driver and rail, a portion at least becomes imbedded in the rail, and at last the friction is increased to such a degree that a resis-

tance to the car wheels is attained which notably affects the labor of drawing a train. A fine coating of dust upon the rails is related in some experiments to have visibly retarded a train, and as this is the average of the operation upon both driving and running wheels, we have a pretty good idea of the effect of a fine layer of siliceous particles ground into the rail. In short the least examination will satisfy any one of the impropriety of habitually introducing sand or any substances between the wheels and the rail.

The presence of fluid, either in a continuous coating or in drops upon the rails is likewise supposed to retard the progress of a train. But the amount and order of effect in this case is quite uncertain. It is commonly asserted that a slight dew causes more delay than a soaking rain. That this has been proved by careful experiment is not probable, but general observation would seem to favor the truth of the assertion.

Upon this point the result of direct experiment is needed to give us any data for discussion of the subject. Theoretically speaking, the effect of dew should be more unfavorable than that of rain but the proportionate loss of power is wholly undetermined.

The presence of a film of rust upon either rail or wheel is undoubtedly productive of a retarding effect: although no means are even provided for preventing it. A very simple and yet efficacious protection would be found in applying small pieces of zinc to the wheel and rail close to, but not upon, the bearing surface. The galvanic protection of rails and wheels is impracticable in the ordinary form of "galvanized iron," but still no attempts have been made to introduce any preventive, and as the plan above proposed is so exceedingly simple we cannot but recommend it earnestly to the adoption of Engineers.

The consideration of this subject, leads to that of the effect of different kinds of surface, produced by various qualities of iron or different modes of manufacture. That a skilfull application of these varieties of surface, will lead to an increase of the maximum effect of engines, cannot be doubted. We shall reserve this branch of the question for another article. Meanwhile the hints already thrown out, may lead those who have any information, to put it in form, and give some numerical data for the further discussion of the subject.

DRAINAGE BY BORING.

The French Engineers have for several years made use of a mode of local drainage, which is almost unknown in this country and in England—we refer to the use of artesian borings, terminating in an

absorbent stratum. The first application of this system was for the purpose of removing foul water from sewers and manufactories in the vicinity of Paris, where a surface drainage was impracticable, either from the nature of the ground or from the pestilential character of the water. Although from the large quantity of solid matter suspended, these borings were liable to stoppage, it was found that the absorption from two wells could be carried to 157 cubic metres per diem.

The disadvantanges attendant upon this first experiment, will not occur in most cases, in which this mode of drainage will be entirely appropriate. A recent instance in the construction of the Left Bank Versailles railway is mentioned by the French journals, in which boring was resorted to with considerable advantage. The accident is similar to those which have happened upon English and American railroads, although sometimes under circumstances preventing a resort to the remedy. We give the details as stated in the Civil Engineer and Architect's Journal.

"A large embankment was in progress to join the viaduct then building, but the deposit of earth had scarcely begun when an extraordinary motion was communicated to the adjoining soil. In two places it was lifted up eight or ten yards above the surface, the road was blocked up, and several houses on the disturbed site were upset. It was found that this operation proceeded from a stratum of clay, mixed with sand, and soaked with last year's rains, so as to become fluid; that the weight of the embankment, thirty yards high, and that of the superincumbent strata had put this pulpy mass in motion, and that it had disturbed the adjoining soil on the slope of the valley, and had in several places lifted up and broken through the upper strata. The cause was apparent that water did the mischief, and though it might not have shown itself immediately if the season had been dry, yet ultimately it would have been productive of serious evil. To remedy this, there were no other means than to stop the flow of water arriving from the upper levels; to carry which into effect it was necessary to cut the clay stratum and replace by stone work, which would surround the site on which the embankment was to be formed, and divert the water. This operation was found exceedingly difficult, having to be carried on at a depth of from six to twenty yards in a moving soil, saturated with water; it was long, very dangerous, and an accident might have wasted much valuable time, the works of the embankment being suspended in the meanwhile, and the stone work itself being liable to be swallowed up in a few years, and the work to be done over again.

Under these circumstances, the engineers thought it advisable to have recourse to boring for the purpose of absorbing the water, and applied to the General Well-boring Company at Paris. This mode was also difficult, as the boring tube got plugged up in the soft stra-

tum as fast as it was emptied, but by means of good tools this was at last got over. The first boring reached twenty yards, and got into the upper part of the chalk, notoriously full of fissures, and where the water was rapidly absorbed. The second and third borings were carried to thirty-five and forty yards in order to get at the chalky fissures which communicate with the Seine, and feed the neighboring wells. A series of borings will therefore be carried round the embankment at proper distances and drains if necessary made to carry the water into the borings, which can easily be kept clear by means of a valve and cord. It is proposed also to apply this method to get rid of the water in sand, but this necessarily depends on the strata, for we believe that in the Kilsby tunnel it would not have been practicable."

It must, however, be understood that this system of drainage is confined to a peculiar geological formation. In the first place, such accidents are most likely to happen in *basins* where no external outlet is to be found, and where none can be constructed, either from the great distance or total absence of regular water courses. 2nd, There must be beneath the retentive soil an absorbent substratum, either of fissured rock, as in the instance cited above, or else of loose sand. The extent of the basin will of course have some influence upon the adoption of boring, as the quantity of water to be removed may be too great to find an exit through any number of borings that can be made at any reasonable cost.

There are, no doubt, many cases where a line of railway is made to deviate from its course for the purpose of avoiding swampy ground, when the perforation of a mass of hard pan or of stiff clay would remove all difficulties. This is a frequent occurrence in diluvial soil, where the absorbent stratum is close at hand.

Another application of drainage by boring, attended with great economy of time and money might be made in the common case of marshy ground on dividing ridges. The location is necessarily confined to the lowest ground, and the worst soil. The excavation is both inconvenient and costly, and generally the road bed for some distance becomes the outlet of the water. A judicious system of borings *previous* to the excavation, would in most cases, greatly reduce the expense of the grading, and preserve the track both before and after its completion from any injury by a sudden overflow of water. Often, perhaps, a well of no great depth would supersede the necessity of boring, but when the porous soil is more than a few feet from the surface no other method than boring can be adopted.

It is hardly necessary to remark that nothing of the kind must be attempted unless under the direction of an intelligent person who has some acquaintance with geology, or who possesses much local knowledge of the conformation.

The great economy of such a mode of drainage deserves the attention of the profession.

SUCCESSFUL RESULT OF THE GREAT ARTESIAN BORING AT GREENELLE.

It is well known that for several years an immense experiment upon Artesian well boring, has been carried on at Greenelle, a suburb of the French capital. In the latter end of February this undertaking was crowned with success and the heads of the Parisians well nigh turned, by the plentiful supply of water which appeared.

The boring has been conducted by Engineers Mulot, father and son. More than seven years have elapsed since the commencement of the boring, which has attained a depth of 547 metres, or 1774½ English feet.* The entire expense of the work has been 168,000 francs.

The great difficulty of working the immense borer can hardly be conceived. Four several fractures have taken place. On one occasion over *four hundred* yards of iron bars broke off, and *fourteen months* were required to remove all the pieces. At another time the bore falling an immense distance penetrated the stratum of hard chalk for 80 feet.

The quantity of water thrown out after the removal of part of the apparatus was estimated at 40 millions of litres per diem. This discharge is, however, accompanied by a vast quantity of sand, which would prove a serious encumbrance, were it expected to continue.

The entire removal of the boring apparatus gave a further increase in the supply. The water appears from experiments which have been made, to be nearly pure, at least far superior to Seine water in use.

The most liberal rewards have been given by the municipal authorities to the Messrs. Mulot, and to the workmen. The former have been indemnified for the loss they have sustained on the contract, and M. Mulot, Sen., has received the Cross of the Legion of Honor from the King.

FIRE CAUSED BY THE COMBUSTION OF CREOSOTE.

A very serious fire occurred at the depot of the Great Western Railway, by the accidental inflammation of a vat of Creosote into which a candle had fallen.

The creosote had been used in an experiment for the purpose of ascertaining its effects as a preservative for timber. The persons

* This is about 1200 feet below the level of the sea.

employed were in all probability not aware of the dangerously combustible nature of this substance, and the impurities with which it is apt to be mixed—the result of their ignorance or carelessness, was the destruction of an immense quantity of timber, besides buildings, etc., to a large amount.

This accident shows the necessity of guarding against the use of inflammable or explosive substances by persons unacquainted with their properties.

The propriety of using creosote is moreover quite doubtful, as its cost, its combustibility, its unpleasant and even unhealthy odor, are not counterbalanced by any redeeming properties—while equally effective preservatives are to be found which are liable to none of these objections.

STEAMSHIP PRESIDENT.

The prolonged absence of this vessel has given rise to the most painful apprehensions. But not satisfied with the present disquieted state of the public mind, we find some persons taking advantage of this opportunity to decry steam navigation upon the ocean, and attempting to prove that in proportion to the size of the vessel, is her danger of encountering disaster increased. The question should be discussed, when all doubt in regard to the safety of the President is removed, and by no means under the present state of excitement. A writer in the London Mechanics' Magazine, states that the delay or disability of the President, is in a measure to be attributed to a change in the form of her paddle board. Those formerly used were Galloway's patent, but some difference occurring between the Company and the proprietor of the wheel, as the former were not willing to make the proper payment, they were obliged to discontinue their use, and employ the old form of paddle board. The loss of time and power, and the danger of accident, is therefore supposed to be increased. How far the assertions of this writer are correct we are not prepared to say.

We, however, are *not* inclined to believe in the loss of the President. In all probability, the machinery has become crippled and her masts have been carried away. The aid to be derived from any jury mast that could be rigged, would be exceedingly small for so large a vessel, and consequently she has been suffered to go whither soever the current has set. This would give her a chance to fall upon the coast of Africa, the Cape de Verds, or even the Azores, as circumstances have occurred favorable or otherwise.

There is every reason to hope that a few days, or weeks, will give us intelligence of her safe arrival in some obsure port, from which

vessels do not frequently find their way to great European, or American markets.

We are able in this number to give an original communication from Mr. Klein, the assistant and companion of the late Chev. de Gerstner, in his tour through the United States. It will be remembered that we announced sometime since that an arrangement had been made to secure the regular contribution of articles from Mr. Klein. The great length of time which had elapsed without any intelligence from him, had been to us a matter of surprize, but by a recent letter, we learn that unavoidable causes have prevented his communicating with us. Mr. K. is now making a professional tour through Europe, and we hope to give our readers the result of his observations, in a regular series of papers.

For the American Railroad Journal and Mechanics' Magazine.

NOTES ON THE STEAM NAVIGATION UPON THE GREAT NORTHERN LAKES—*By L. Klein, C. E.*

The means of internal communication in the United States are furnished principally by railroads, canals, and steam navigation; all three are of nearly equal importance, and tend in a like manner jointly or separately, to facilitate intercourse between remote parts of the great American Continent, and to develope the vast resources of the immense territory occupied by the United States. But while railroads and canals have always received due attention, on the part of the engineer, and while we daily have occasion to see numerous reports and investigations on their construction, management, etc., the progress of steam navigation, in the *interior* of the United States, appears to be regarded with much less interest, and even with indifference. By communicating the following notes, for which I have collected the data on a tour over the lakes in the summer of 1839, I wish therefore, to call the attention of engineers to an interesting branch of their profession, and to occasion *perhaps some further* inquiries into this subject.

The waters in the interior of North America, upon which steam navigation is carried on to the greatest extent, and on the grandest scale, are, 1st. The rivers in the west, that is, the Mississippi—justly called the father of rivers—with its tributaries; and, 2nd. The great northern lakes. The entirely different character of these waters, in regard to the facilities they offer and difficulties they oppose to navigation, has a great influence upon the construction of the steamboats and their engines, and consequently, upon the management of the boats running upon them respectively. The difference of management produces, of course, a difference in the cost of run-

ning steamboats, which latter will be principally the object of the present remarks, in which I will speak only of the steamboats upon the lakes, reserving those upon the rivers for a future article.

There are six great lakes in the north of the Union, viz: Ontario, Erie, St. Clair, Huron and Michigan, all connected together by straits or rivers; four of them, Erie, St. Clair, Huron and Michigan, are in *nearly* the same level, and elevated from 565 to 580 feet above the Atlantic ocean; no difficulty exists for vessels of every sort to enter from one lake into the other. Thus nature has furnished the north with a magnificent basin, extending over a thousand miles from Buffalo to Chicago. Lake Superior lies 18 feet higher than Huron, with which it is connected by the river St. Mary. To overcome the falls of the latter, the St. Mary's ship canal is now constructing by the State of Michigan, and its completion will add another basin of 400 miles in length to the one above mentioned. Lake Ontario is elevated only 232 feet above the ocean, and therefore 333 feet lower than lake Erie. To overcome the mighty Falls of Niagara, the construction of a ship canal has long since been contemplated by the United States government, but will hardly be effected. In Canada, the Welland canal has been constructed for this object, it is 36 miles in length, and overcomes, by means of 34 locks, a fall of 334 feet. The dimensions of this canal being however sufficient only for vessels of 125 tons burden, steamboats can not pass by it from one lake into the other. With reference to lake Ontario, which is so much lower, the other great lakes are generally called the "Upper Lakes," and as lake Superior is not yet accessible from lake Huron—the "steam navigation upon the upper lakes" always denotes the navigation by steamboats of lakes Erie, St. Clair, Huron and Michigan.

The first vessel upon the lakes was the "Griffin," built at Erie, in 1679, for the expedition of La Salle. The first steamboat upon the upper lakes made its appearance in 1818, her tonnage was 338, while the whole tonnage of all the vessels upon these lakes amounted at that time to only 1000 tons. The want of safe harbors and of means of easy communication with the interior of the neighboring States, was the reason of the slow progress of lake navigation, until the year 1832 when by the completion of the Welland and Ohio canals and of the principal harbors on the shores of Pennsylvania, Ohio and Michigan, the tonnage had increased to about 10,000. In 1836 the upper lakes were navigated by 45 steamboats, with a tonnage of 9,017, and in 1839, already, by 61 steamboats with a tonnage of 17,324. Most of these boats are very large as will appear from the following list of 25 of them, giving

their tonnage and dimensions, the port where, and the year when constructed, power of engines, and their cost and value.

LIST OF THE PRINCIPAL STEAMBOATS UPON THE UPPER LAKES IN 1839.

No.	Name of boat.	Tonnage. tons.	Extreme length. feet.	Length of beam. feet.	Depth of hold. feet.	Where built.	When built.	Horse power of engine.	Cost or value of boat.
1.	Illinois,	800	205 1-2	29 1/8	13 1/12	Detroit,	1838	196	$120,000
2.	James Madison,	630	178	30 3/4	12 1/4	Erie,	1837	160	75,000
3.	Buffalo,	600	189 5-12	28 1/4	12	Buffalo,	1838	200	80,000
4.	Cleveland,	580	180	28 11/12	11 3/4	Huron,	1837	225	80,000
5.	Erie,	500	176	27 5/12	10 5/6	Erie,	1837	250	80,000
6.	Constellation,	484	150 1/2	28 1/2	12 1/12	Charleston,	1837	120	60,000
7.	Michigan,	473	156	29	11 1/6	Detroit,	1833	160	60,000
8.	Rochester,	472	158 5-12	27 1/4	11 1/2	Richmond,	1838	190	40,000
9.	Bunker Hill,	457	154 1-3	28 1/3	11 1/2	Black River,	1837	190	40,000
10.	Constitution,	444	140 3-4	28 1/12	11 5/6	Conneaut,	1837	184	47,000
11.	Thomas Jefferson,	429	174	26 2/3	9 3/4	Erie,	1834	150	50,000
12.	Chesapeake,	418	172	24 1/2	10 1/6	Maumee City,	1838	120	40,000
13.	De Witt Clinton,	413	147	27 1/6	11	Huron,	1836	90	35,000
14.	Milwaukee,	401	172	24 3/4	10 1/12	Grand Island,	1837	150	50,000
15.	Wisconsin,	500	157	29	11 1/2	Conneaut,	1838	250	65,000
16.	Pennsylvania,	395	150	25	11	Erie,	1832	180	20,000
17.	Columbus,	392	121	28 1/2	11 7/12	Huron,	1835	150	40,000
18.	Sandusky,	377	148	26 1/4	10 1/12	Sandusky,	1834	180	50,000
19.	United States,	367	140	28 1/3	10	Huron,	1834	160	30,000
20.	Lexington,	364	152	22 1/2	11 1/12	Black River,	1838	80	30,000
21.	North America,	361	147 2-3	26	10	Conneaut,	1834	160	30,000
22.	Daniel Webster,	358	128 1-4	24	11 1/4	Black Rock,	1833	100	40,000
23.	O. H. Perry,	352	146 1-6	26 1/4	9 5/12	Perrysburg,	1834	160	35,000
24.	Monroe,	341	144 1-2	26	9 1/2	Monroe,	1834	130	35,000
25.	Chas. Townsend	313	136	24	10	Buffalo,	1835	60	12,000
25	Steamboats.	11,221						3,995	$1,244,000

The average of these 25 steamboats, is 449 tons burden, 160 horse power, and $50,000 value. There were besides, some other large boats upon the lakes in 1839, as the "New York," with 325 tons, the "Robert Fulton," with 368 tons, "Chautauque," with 340 tons, (upon the lake of that name,) "Vermillion," with 400 tons, and "General Scott," with 324 tons. The value of all the steamboats of the upper lakes in 1839, was $2,500,000.

The steamers of the lakes are built much more strongly and durable, than those upon the rivers; they also draw much more water, and have engines of greater power. The larger lake boats have generally low pressure engines, while those of the western rivers are almost exclusively provided with high pressure engines.

The steamboats are owned either by private individuals or by companies, in the latter case, the owners divide the profit in proportion to the capital contributed. They make regular trips between Buffalo, Detroit and Chicago, stopping at most of the intermediate ports, to take in wood, or to land and receive passengers and freight. Between the smaller ports a communication is separately maintained by means of smaller boats.

Of the large boats, running regularly between Buffalo and Detroit, the "Erie," is regarded as one of the finest and fastest. She was built at Erie, received her engine from Philadelphia, and is in use since 1838. Her principal dimensions will be seen from the foregoing list; the extreme width, including the wheel chambers, is 51 feet 6 inches. She has a low pressure engine with a vertical cylinder of 52 inches diameter, and 10 feet stroke; the steam is cut off at half stroke. The diameter of the paddle wheels is 24 feet, their width is 11 feet, the length of the paddles is 5 1-2 feet, being placed alternately, and divided into two compartments. The dip is 30 inches. The boat draws, empty, 5 1-2 feet, and loaded, 7 -12 ft.

The interior arrangement is not much different from that of the other lake steamers. The gentlemen's cabin, is under the spar deck, 50 feet in length, and contains 50 berths, in 3 tiers. Over this cabin, upon the lower or spar deck, is the ladies' cabin, surrounded by state rooms, each with three berths, and the doors of which open outside to a gallery. The steam engine occupies the middle part of the lower deck, between the wheel chambers, and on both sides of the machinery are the cabins of the captain, mate, engineer, the kitchen, bar and wash room, water closets, etc. In front, are the boilers, 4 in number, each 15 feet long, 5 feet wide, and 12 feet high; they reach from the bottom of the hold to some feet above the deck; at the bow of the boat, is the cabin of the fore-deck passengers, also below deck; and between it and the boilers, ample room is left for the firemen and part of the fuel. There is no space in the hold for storing goods. Two stairs lead from the lower to the upper deck, which, in fair weather, is perferred by the passengers. It is about 140 feet in length, and averages 40 feet wide; containing nothing upon it but the wheel house for the steersman.

Since May, 1838, the Erie, (captain Titus,) makes regular trips upon lake Erie, between Buffalo and Detroit. She carries principally passengers, of which she can accommodate 150 in the cabins, and a great number on the fore deck, When required, 600 passengers in all, may be taken on board. She is not intended for carrying freight, but takes it sometimes on deck. Usually, the boat stops at six or eight places on the route between Buffalo and Detroit, and performs the distance between these two ports, 360 miles, in 37 hours, includding stoppages. The average speed of the boat, while running, is 14 miles per hour; but once, she has performed the trip from Detroit to Buffalo, in 21 hours and 23 minutes; having touched, this time, only at two or three intermediate ports; the distance travelled, was 320 miles, and therefore the average speed, 15 miles per hour. Every six days, the Erie made (in 1839) a circular trip, from Buffalo to Detroit and back, and supposing the navigation to be open during eight months in the year, her yearly performance will be 40 trips, of 720 miles, or 28,000 miles.

The crew of the boat, consists of the following individuals, with the annexed salaries:

1st captain, with a salary of $1000 per annum;
1st clerk, $50 per month;
2 mates, one 70, the other $30 per month;
2 engineers, the chief engineer 600, and the assistant $400 per year;
6 firemen, each $20 per month;
8 deck hands, each $20 per month;
2 deck boys, one 10, the other $8 per month;
2 porters, one 15, the other $5 per month;
1 steward, $30 per month;
3 waiters, one 18, and two with $12 each, per month;
1 chambermaid, $20 per month;
3 cooks, 35, 20 and $15 per month;
1 barber, without salary;
1 barkeeper, do. do.;

34 individuals in all.

Although navigation is seldom open for a longer period than eight months in the year, the greater part of the crew is engaged and paid for nine months, and captain and engineers receive their pay for a whole year. The amount paid annually for salaries is, therefore,

To captain and engineers, - - - - - -	$2000
" clerk and mates, for nine months, - - -	1350
" 6 firemen, 8 deck hands, and 2 boys, - -	2682
" 2 porters, - - - - - - - -	180
" steward, waiter, cooks and chambermaid, -	1458
Total, - - - - -	7670

which, divided by 40, the number of trips made in one year, gives the expenses per trip, $192.

The whole current expenses per trip, (of 720 miles,) as stated by captain, (1839) are, however, not less than $700

And consist of the following three principal items:

1st. Salary of captain and crew, amounting as above stated, to - - - - - - - - - - - - 192

2nd. Cost of fuel for the engine, at an average of one cord of wood consumed for every 4 miles the boat is running, making 180 cords per trip. The price per cord varies from $1\frac{1}{2}$ to $2; taking the average at $1\frac{3}{4}$, we have as the cost of fuel, per trip, - - - - - - - - - 315

3d. All other current expenses, as for boarding passengers and crew, for bedding, washing, oil, etc., etc., must therefore, amount, according to the statement of the captain, to 193*

Total, as above, - - - - - $700

To this sum, must be added another for the depreciation of the boat. The cost of the "Erie" was $80,000, including $33,000 for the steam engine, and $3000 for fixing the same, etc. It is generally estimated, that a good lake boat will last from ten to twelve years. If ten years are allowed for the "Erie," the annual depreciation must be taken into account at $8000, which makes per trip, $200. In this sum, we may, however, also include the cost of the ordinary repairs; as the boat and engine will have some value after ten years. We then have, as total expenses for running the "Erie," per trip of 720 miles, $700 \times 200 = \$900$, or *per mile of travel* $\frac{900}{200} = \$1\ 25$.

If we are going to compare the cost of running steamboats, with the cost of running trains upon railroads, we must, from the above $900, deduct the expenses incident to the boarding of passengers, which cannot be estimated per trip at less than $100; the proper expense of running the "Erie" 720 miles, is, therefore,

* No allowance appears to be made for office expenses, printing, advertising, insurance, or wharfage, the amount of which must greatly augment the sum total.—*Ed.*

only $800, or per mile of travel, $\frac{800}{720}$ = *one dollar eleven cents;* an amount which will be often found to be the expense of running a train of cars upon a railroad one mile.

In 1839 the fare for a cabin passage between Buffalo and Detroit was $8, or 2 2-9th cents per mile, including board. A deck passenger paid only $3 for the same distance, or 5-6th cent per mile, without board. For smaller distances the fare was, however, proportionately greater, as, for instance, between Buffalo and Cleveland, (194 miles), $6, equal to 3 cents per mile.

The charges for freight were, from Buffalo to Detroit (up):

For heavy articles, 30 cents per hundred weight.

For light articles, 46 cents per hundred weight.

At an average, therefore, of 38 cents per cwt., or $7 60 per ton, of 2,000 lbs., this is equal to 2 1-9th cents per ton per mile.

From Detroit to Buffalo (down) the charges were:

For flour, per bbl., - - - - - - -	20 cents.
Provisions, per cwt., - - - - - -	10 "
Tobacco, seeds, etc., per cwt., - - - -	15 "
Wool, deer-skins, etc., do. - - - - -	25 "

The charge of 20 cents per barrel on flour, and of 10 cents per cwt. on provisions, is equal to only $\frac{5}{9}$ cent. per ton per mile, (!) which is certainly lower than can be charged by any other mode of conveyance in the United States, and proves, that in regard to the rates of transportation, steamboats do not need fear competition from canals and railroads, if they can command a sufficient traffic, and the route they are going between two places is pretty direct.

The gross receipts of the "Erie," averaged per trip, about $1200, ($1 67 per mile). If we deduct therefrom, the expenditure of $900, as above calculated, there remain $300 as the nett profit, per trip, and 40 trips being made per year, the annual nett income amounts to $12,000, or 15 per cent. on the cost of the boat. As $8,000 for general depreciation is put under the head of expenditure for every year, the capital invested in the second year will only be 72,000, in the third year, 64,000, in the fourth, $56,000, and so on; but it must be taken into consideration at the same time, that with the increased age of the boat, her productiveness decreases; because other steamers of later construction are coming in vogue, and offer more attractions to the travelling community.

(To be continued.)

Cast Iron Rails.—The introduction of cast iron rails in this region appears to have excited very general and deserved notice. The advantages which a railroad possesses, in every desirable quality, constructed of

these rails, in place of the old fashioned wooden one, must be apparent to all who have made the necessary inquiries on the subject. A cast iron railroad cost but a trifle, comparatively speaking, more than one made of wood and faced with wrought iron; and its durability and solidity is so much greater, as to enhance its value tenfold. Let us examine into the respective cost of these roads:—

Cost, per mile, of cast iron rails, sufficiently strong to permit the transportation of a weight equal to three tons over it,	$2,650
Cost of wooden rails, faced with wrought iron, for the same distance and of equal strength.	1750
Difference,	$900

The cost of laying down the road, sleepers, etc., will be about the same on each road. The weight of the above cast iron rails is estimated at 35 lbs. to the yard, and at a cost of $50 per ton.

As we said before, the great advantage of cast iron rails is their cheapness and durability. The wooden roads used in our mines require to be renewed every three years; and the wrought iron with which they are faced, owing to the action of the water, which is greatly impregnated with sulphur, corrodes, to such an extent as to become almost worthless. Of course this objection cannot be urged against cast iron rails. The rails may occasionally break, but half of their original cost may be procured for them in that state as pig metal.

We understand that Messrs. Marshall & Co., the proprietors of the furnace in this Borough, are casting a rail weighing only 25 lbs. to the yard, suitable for drift roads, which will cost about $1,000 per mile. They have already received orders to a large amount from a number of our colliers, for these lighter rails, and but a short time will elapse before they will be in general use on this region.

Mr. Charles Lawton of this Borough, has introduced these rails in his mines, and gives the most favorable account of their qualities. He assures us that they are far superior to the wooden rails—can be laid down much easier—and that a horse—can draw nearly double the draft he formerly could over the wooden rails with their facings of wrought iron.

RAILROADS, CANALS, TAXES, DEBTS, BUSINESS AND PROFITS.—An eastern paper, in going over the fiscal situation of several of the states arising out of their system of internal improvements, pauses, as might be expected, over Pennsylvania, and points to the debt on one side, and the incomplete undertakings on the other; viewed thus or viewed any way, perhaps we are in a lamentable situation, and present to the world, if the case be unexamined, a poor argument for physical improvements. But it is due to the early and steady friends of the internal improvements of Pennsylvania to say that it was not the measure, but the administration of the measure, that involved the state in its present *inconvenience*. Had a set of canal commissioners been retained at a salary suited to the services of men competent to the great work and had the whole business of letting and reletting and employing agents along the line been conducted in the way in which a man of business habits would have conducted his own affairs the state of Pennsylvania would have now been in the enjoyment of a large revenue from her public works, the lateral branches as well as the main line, and would have only half the interest to pay which she now is called on to meet. This is a fact so obvious, that we need not adduce proof. But as bad as the state of affairs

now are, they can be worse, and they must be worse, unless a new system of administration is adopted. What that system should be need scarcely be mentioned, since almost any change would be for the better. We need, however, if possible, to have the whole business of internal improvements removed from the influence of party action. Principles suffer, but the effect is remote. A fiscal maladministration soon evinces itself in general disturbances. When both go together, the evil, unless timely checked, is irremediable.

If the subject of making canals and railroads was worthy of a convention, surely now that their advantages are evident, their proper management is well worthy of public regard. We must remark, "in passing," that though hitherto the income of the canals and railroads has not met the actual expenses and the interest of the investment, yet no argument must thence be drawn against the public value; because, in addition to shocking mismanagement, which may yet, and will, we doubt not, be remedied, there have resulted to individuals and the community almost incalculable benefits from the use of those improvements. Pittsburgh and Philadelphia, and the towns between the northern section and the southern section, all profit by these improvements. It is only the state, the commonwealth, that *loses;* so that while we collectively complain of the drafts upon the state treasury, it is certainly only justice to say that individual advantages have been great; and if we compare what we are now, in the way of business, with what we might be, nay, should have been, without canals and railroads, we certainly have some cause for felicitation.—*U. S. Gazette.*

Railroads.—Ten years ago, railroads, as a means of general transit for passengers and goods, were almost untried. Now, they are spreading over the country like a net-work; about one hundred and fifty railroads are already in use in Great Britain and Ireland, and upwards of sixty millions of money are invested in them. They are upsetting all our former notions and alteriag our social condition; they are pouring the country into London, and spreading London over the country. Northwards we are carried as far as Lancaster, a distance of 241 miles from London, in eleven or twelve hours, by the London and Birmingham, Grand Junction, North Union, and Lancaster and Preston; where, though for the present it stops, there will no doubt be a continuation by Penrith to Carlisle and Glasgow. The same lines link with Wigan, Bolton, Manchester, Liverpool, etc. At Rugby, 73 miles from London, on the London and Birmingham line, the Midland counties carries us to Nottingham and Derby; and at Derby we can get, by the North Midland and its junctions, to Chesterfield, Sheffield, Leeds and York; or, instead of going on to York, we may double, like a hunted hare, turn to Hull by Selby, or from Selby to Leeds. At York, the great north of England railway, now in progress, will carry us to Durham and Newcastle; and at Newcastle we can cross the island to Carlisle. Returning to London, we find the great western railway opening to us the western coast, and by it and its western junctions, not only enabling London citizens to spend a day comfortably at Windsor, but joining Bristol and Bath, Gloucester and Cheltenham, either now or shortly. The south coast again, is also free to us by the Southampton and Brighton railways, along with the Greenwich and its adjuncts, to Croydon and Dover—all either made or making. Again, the northeast coast is accessible, by the eastern counties, and a railway to Ipswich and Norwich; and all who wish to avoid the intricacies of the London portion of the Thames, called "The Pool," or who are in a hurry to reach a dinner of white bait, can be whirled from the city to Blackwall.—*London Chronicle.*

REPORT OF THE ENGINEER UPON THE SEVERAL DEFINITE LOCATIONS FOR THE HARTFORD, AND SPRINGFIELD RAILROAD:

HARTFORD, MARCH 2ND, 1841.

(Continued from page 288.)

5. POQUONOC AND SUFFIELD ROUTE.

All the lines heretofore described most naturally make their southern terminations in the northern and eastern portion of the city of Hartford; affording, however, a ready communication with the depot of the Hartford and New Haven railroad company, either by passing through the city with horse power or by curving around on its western border. The two lines next in the order of description most naturally have their terminating points in the western part of the city. The map will indicate different proposed lines surveyed for forming a connection from them with the river navigation. The detailed estimates show that the expense of connecting the eastern lines with the Hartford and New Haven railroad depot, will not be greater than the cost of connecting the river interests with these western routes, unless a grade of fifty feet descent to the mile is adopted, then the western lines will have a decided advantage in forming such connection, or the main line may terminate as indicated on the map, at a lot on the north part of Main street, from which a branch line may pass easterly to the river, and another southerly to the depot of the corporation before mentioned. This would, however, require grades of sixty feet to the mile. I now invite your attention more minutely to the particular line under consideration. This commences at a point on the superstructure of the Hartford and New Haven railroad, situated one thousand feet west of the depot of said road; from this point the line deflects to the north, with a level grade, on a curve having a radius of fifteen hundred feet, and terminating at a tangentisal point on the southern border of Asylum street. It is obvious that the line may pass the street named at various places east of its present location. This particular crossing, however, is chosen with a view to pass the train of cars, under that great thoroughfare, through an arch or covered way, and to continue the same in such a manner under the surface of the lands intervening between this point and the river, as to leave unimpaired that beautiful estate with its pleasing associations. For this purpose the grade of the street will require to be raised from four to five feet. Various other plans for crossing this street, with and without locomotive power, are herewith presented (marked D.) From the termination of the curve just mentioned, the tangent takes a northerly course, encountering a succession of moderate cuts, until it arrives at the Poquonoc factories on the Farmington river; crossing that stream, the line, after making a slight curve, to the east, has, in general, a direct course along the level ground east of Suffield; passing over the plains south of Agawam, it descends with a moderate grade into the valley of Agawam, crossing the Agawam river, and turning on a radius of two thousand feet, with a level grade, it unites with the Western railroad, as shown on the map. This is a cheap route in most respects, and when definitely located, will be to a small extent, shorter than any practicable line that can be run between Hartford and Springfield.

It is necessary to adopt two grades of forty-five feet to the mile, on a a straight line, or to build an embankment at the Poquonoc factories of the height of sixty feet. Judging from recent suggestions that I have received from gentlemen well acquainted with the country in the immediate vicinity of this line, I think it important that some further examinations should be made.

6. RAINBOW AND SUFFIELD ROUTE.

This line crosses Asylum street in the manner proposed for the Poquonoc and Suffield line; from this street the line is straight, bearing north 2° 7', east for about ten miles, which brings it to the Rainbow factories, on the Farmington river, and which are situated nearly midway between the factories at Poquonoc and those at Tariffville; from this point, after describing a curve, bearing to the east on a radius of 5000 feet, the line continues direct, bearing north 25¾° east for about thirteen miles, and until it has crossed the Agawam river, and commences the requisite turn to unite with the Western railroad, as shown on the map.

This line passes the Farmington and Agawam rivers at the most desirable points. The foundation for the bridge at the Agawam must be placed on piles below the bed of the stream. The crossing at the Farmington river may have natural rock abutments to the height of forty feet; the piers will also rest on a rock foundation. By curving the line eastwardly, as indicated on the map, it may pass along on the eastern side of the Windsor plain, and cross the river at any desirable height above the water not less than forty feet. On the line just mentioned, the piers require to be built to the height of sixty feet. Sufficient soundings and other examinations have been made to enable me to state with confidence, that neither clay, quicksand, hardpan, or rock, will be found on this route, unless clay occurs to a small extent near Hartford. I ought here to remark that by breaking those long straight lines into various lengths, and locating moderate curves between them, some fifteen or twenty thousand dollars may be saved in the expense of grading.

7. BLOOMFIELD AND SUFFIELD ROUTE.

This line was run because the face of the country showed that it could be graded at less expense than any other entire line; but its increased length forms an objection which is not compensated in the diminished cost of grading.

BLOOMFIELD AND MIDNEAG ROUTE.

I have been requested to survey another level and very feasible route, passing through Bloomfield, Turkey Hills and West Suffield, and having its termination on the Western railroad at Midneag. The additional length of three or four miles which this line would have as compared with some of the routes described above, will not form the only objection that can reasonably be brought against it.

Having given a general description of the several routes, it now remains to arrange in tabular form the elementary data on which a judgment, respecting the character and expensiveness of your contemplated railroad, must be formed.

LENGTH OF THE VARIOUS ROUTES IN MILES.

East line, extending from Front street in Hartford to the depot of the Western railroad in Springfield,	25.37
Same line, extending from the H. & N. H. R. R. depot to the W. R. R. depot,	26.37
East line on east bank of river, extending from from Front street in Hartford to the depot of Western railroad,	24.89
Same line, extending from depot to depot,	25.89
Combined East and West line, crossing at the foot of the falls, measured from its intersection with H. & N. H. R. R. to the depot of the W. R. R.	24.95
Same line, measured from depot to depot,	25,14
West line on the west bank of river, measured from its inter-	

section with H. & N. H. R. R. to its intersection with W. R. R.,	24.27
Same line, measured from depot to depot,	24.72
Poquonoc and Suffield line, measured from H. & N. H. R. R. to Western railroad,	23.77
Same line, measured from depot to depot,	24.68
Rainbow and Suffield line, measured from H. & N. H. R. R. to Western railroad,	23.91
Same line, from depot to depot,	24.60
Bloomfield and Suffield line, from H. & N. H. R. R. to W. R.	24.62
Same line, from depot to depot,	25.53

SUPERSTRUCTURE.

The necessary excavation upon your route, will afford, in almost every instance, the best material for the road bed. Where this is not the case, a suitable bed for the superstructure must be prepared by excavating a trench, say eight feet in width, and three feet in depth, and filling it with clean sand or fine gravel. The following estimate for a superstructure of the most durable kind, is based on the most approved edge rail, of the ⊥ pattern, weighing 50 pounds to the linear yard. This is only 6½ pounds less than the weight of the rail of the same pattern in use on the Western railroad, where it is required to sustain, upon curves much smaller than those upon this road, the action of such heavy engines as may be required to surmount the maximum grades upon that road of about 80 feet to the mile. The Long Island railroad, which cannot be characterized as being more favorable than yours in point of grades, or curvature, has a rail of the same pattern, weighing 40 pounds to the yard; and this is heavier than some of those in use on similar roads in Europe.

ESTIMATED COST OF ONE MILE OF SUPERSTRUCTURE.

21,120 feet (board measure,) of longitudinal ground sills, 8 inches wide by 3 inches, at $13 per M.	$274 56
5,000 feet of bearing sills at the joints,	65 00
1,760 sleepers, 7 feet long by 8 inches thick,	492 80
78½ tons of iron rails, at $50 per ton,	3925 00
704 cast iron chairs, (weight 10 pounds each,)	340 00
9,152 spikes, at 6 cents per pound,	274 56
Laying rails, trenching, etc.	450 00
Distributing materials,	235 00
	$6056 92

Proposals are herewith presented on which the above estimate is based in part.

ENGINES AND CARS.

It is a fact well established by experience, that you do not necessarily double the expense of operating a railroad when you double its length. Strict economy, therefore, requires that contiguous corporations should unitedly operate their respective roads with the same cars and attendants.

The fortunate situation of your road gives a desirable position, from which you may negotiate on either hand with your enterprising neighbors.

It may be desirable, however, under certain circumstances, that this

corporation should operate its own road. I therefore present you with the following estimate.

Three locomotives and tenders,	$19,000
Ten passenger cars,	10,000
Twenty burthen and baggage cars,	8,000
Convenience at Hartford,	8,000
Amount,	$45,000

BRANCH LINES.

The expense of short branch lines connecting some of the most essential interests at the Hartford termination, will require an expenditure of nearly $25,000

LAND AND DAMAGE.

We have endeavored to ascertain since the 20th of February, the amount it would be neceseary to pay for the land, damage and fencing, on four of the entire lines surveyed for your road. It is but justice here to observe, that our applications for terms have met in general with the most favorable reception. Although we have not obtained a sufficient number of bonds on all of the routes, to enable us to make an accurate estimate of the expense of each line, it is not to be inferred from this circumstance, that the proprietors entertain an unfriendly disposition in regard to this enterprise.

In crossing lands of great value, it necessarily requires considerable time, to ascertain the proper amount to be allowed for damage. This is the main reason why we have obtained so few bonds upon the river routes.

In a few days we shall probably have bonds from most, if not all of the proprietors.

The land and damage charged in the 100 bonds obtained on the east line, is 17,213 dollars. I am under great obligations for my success in this part of your enterprise, from the assistance that I have received from Mr. William Allen, a young engineer with whom you are favorably acquainted.

By your written instructions I am required to present an estimate based on proposals from responsible contractors, to grade and finish in the most substantial and thorough manner, your contemplated railroad in all of its parts, by the first day of January next. And bonds under seal, duly executed, were to be procured in order to ascertain the requisite amount of land and damage expenses. These duties I have performed according to the best of my ability; the result is before you. I cannot at this time complete the estimate for the four first routes named, because the bonds for the land and damage could not be procured in so short a time. But upon the route last named the proper bonds duly executed have been generally obtained, which enables me to present the estimate on the required basis as follows:

Cost of road based on bonds for land and damage, and proposals from responsible men for its construction,	$369,657 11
Contingencies,	50,000 00
Amount,	419,657 11

ANNUAL EXPENDITURE.

The expense of repairs for the road and engines, and all contingent outlays for operation of this kind, are easily calculated from experience and

known data, derived from different roads in this country that are in actual use. For the number of passengers with which this road would open, there must be two trips and two return trips each day throughout the year, except Sundays. An allowance must also be made for the salaries of the various officers, and for the repairs of the road, engine, cars, etc. I estimate the necessary outlay for these objects for one year, at $20,000.

RESOURCES OF THE RAILROAD.

In deference to the common practice, a statement may be expected showing the basis, in a pecuniary point of view, upon which the friends of this laudable enterprize invite the co-operation of a discerning public. From the certificates and documents herewith presented the following results are obtained.

The number of passengers through between Hartford and Springfield the past year in stages, has been 21,526.

Amount paid for passage,	$33,289 00
Do. do. Way travel	3,400 00
Do in the river boats, variously estimated at from 8 to 12,000, at $1—say,	8,000 00

Way freight 13,000 tons. Present cost of transportation about $20,000. This will nearly all pass upon your road in the event of a particular location, which, though not certain, is as likely as any other—say from this source, $12,000 00

The unoccupied water power in the immediate vicinity of this road, on the Farmington river, and at the fall of the Connecticut, is unsurpassed, even by Lowell itself.

When your road is constructed to Springfield, the large number of passengers, who now find it for their interest and convenience to leave the valley of the Connecticut river and take an easterly direction across the country to Worcester, then a southerly direction over the Norwich and Worcester railroad, will no longer find it for their advantage to pass over the two sides of a triangle, when they can arrive at the same point, by passing over its third side.

The amount of this travel is estimated at from ten to fifteen thousand passengers—say from this source, $10,000

The amount of long travel from the east is variously estimated at from 50 to 100,000 persons. During the past season they have found it good economy both in time and expense, to pass between New York and Boston over either the Norwich and Worcester or the Boston and Providence railroad. Construct your road in the manner proposed, and the aspect of things will be completely changed. Instead of being four or five hours on the road between Hartford and Springfield, they will then pass this link of the great chain in forty-five minutes. A passenger can then be carried through from New York to Boston during the summer season, by day light. In the winter season the increased inconvenience arising from the navigation of Long Island Sound, is a sufficient reason why travellers will continue to prefer the inland route. Considering that passengers will gain nothing of moment in economy or time by taking any other route from Boston to New York, and that the line of which your road forms a connecting link, passes through a densely populated country, and in the immediate vicinity of some of the most flourishing colleges and other literary institutions in New England, surrounded on all sides with the most beautiful scenery—is it too much to estimate, that one-third of the long travel will pass this way? I estimate the increased income from this source by adding only $10,000

The amount of imports and exports that pass Hartford from the valley of the Connecticut, is stated at 30,000 tons annually. It is believed that the up river freight can be taken from the wharves in Hartford and delivered at Springfield, as reasonably as if taken up the river and through the canal; especially will this be the case with articles of considerable value.

Estimated from this source, $4,000

From the report of Mr. Twining on the preliminary surveys of the Hartford and New Haven railroad, the following statement is made.

"There are now in Springfield and the region round about it, 60,000 spindles in operation, and these I should judge (as 28,000 of the number are stated to consume 8,000 bales of cotton) must create a transportation to and fro of six or seven thousand tons, and probably this same region, when its power shall be fully taken up, will transport five times or even ten times its present amount. A large amount of the cotton to feed these establishments would pass on your railroad, as the new crop does not come in till the river is about closing."

The transportation accounts on the Hartford and New Haven railroad prove the correctness of this statement in relation to winter freight. We can, therefore, safely increase your estimate from this and contiguous sources. 9,000

Tor transportation of mails, add 3,000

The fact is well established that business and travel are much increased by opening a continuous line of railway. Your route cannot be an exception, because it will re-establish the broken links in the old highway between the east, south and west—because it will best accommodate the southern business of a population of more than half a million, residing at present in the valley of the Connecticut; because upon the borders of this great river and its branches, there is according to the report of the Windsor Convention, a water power at present unoccupied, of sufficient magnitude to operate during the season of greatest drought, more than 1000 cotton manufactories, capable of driving more than 4,000,000 spindles.

I cannot close this report without acknowledging the obligations which your corporation and the engineer corps are under for the friendly acts and great assistance received from gentlemen residing on the line of the surveys. I herewith transmit to you the names and residences of those to whom you are under especial and particular obligation. I have also appended a list of those gentlemen who have given bonds to convey to your company the right of way without any pecuniary compensation whatever, and recommend them to especial consideration during the future operations of the road.

All of which is respectfully submitted,
by your obedient servant,
JAMES. N. PALMER, *Engineer.*

To the Surveying Committee of the Hartford and Springfield Railroad.

GENTLEMEN:—By the request of J. N. Palmer, your engineer, I have examined partially in the field, but more particularly the data on which his estimates are based, and from the peculiar adaptation of the countryfor the purposes of a railroad, and the generally good feeling of the land owners. Mr. Palmer has been enabled to make you a low estimate in comparison with other roads of the same length.

The estimates being based as they are, on actual and responsible bids for the construction, and the land damages on actual bonds in your possession, it appears impossible there should be any great discrepancy be-

tween the estimated and actual cost, but in order to meet all possible contingencies, it was mutually agreed to add fifty thousand dollars to the estimated cost.

The difference of estimate between Mr. Palmer and Mr. Twining, is easily accounted for by a careful examination of their respective reports.

Yours, etc.,

P. ANDERSON, W. R. R.

PRIMING OF LOCOMOTIVES.

It will not, perhaps, be thought that we are dilating too much on this part of the subject, when it is considered what immense sums of money have been expended in running after that *ignis fatuus* steam locomotion on common roads, and ending after all, as has been observed by some one, in bringing us to the humiliating conclusion, that *a sixteen horse power engine will not propel a four horse coach.* Now the priming or the flushing of the boilers, which are necessarily of very small dimensions, is acknowledged on all hands to be the principal difficulty that the various projectors have had to encounter; consequently, there arises the necessity of using steam of two or three hundred pounds per square inch, as appeared by the evidence of Mr. Gurney and others, before the parliamentary committees a few years ago.

It must not, however, be taken for granted that we assent to the first of the above conclusions as containing any thing in the least discouraging to any intelligent projector of steam carriages. For who that really deserves to succeed ever expected that less than a sixteen horse engine will be required to drag a four horse coach upon ordinary turnpike roads, when probably one half of the power of the engine is required to propel itself. The only difficulty as to the engine, is to have a sufficient power in the smallest possible space; to effect which, there can be no doubt that the reciprocating principle, with all its rods, guides, cranks, and crooked contrivances must be entirely thrown overboard, and a simple and effective rotary engine substituted. It is, however, well known, that amongst all the difficulties steam carriage makers have had to contend with, the boiler has always been the grand rub. That being, as it is termed by the eccentric Col. Maceroni, the very "soul" of a steam carriage, and as it is, indeed, of any other sort of steam engine.

Although the steam chambers of the boilers of railway locomotives are not so confined as those just mentioned, yet we venture to affirm, from a general knowledge of the working of the travelling engine upon railways, from its first introduction into the county of Durham in 1815, and a pretty close attention to the numerous alterations and improvements attempted on the Liverpool and Manchester railway, from its opening up to the present period, that the want of sufficient steam room has been the cause of some of the greatest difficulties that railway engineers have yet had to contend with, however unwilling they generally are to admit the fact. How far increasing the gauge of the railway, as is now being done by Mr. Brunel on the Great Western line, will tend to lessen the enormous* expense of railway travelling, by admitting the possibility of using larger boilers as well as larger wheels, remain to be seen.

It is a fact of the very utmost importance, and deserves the attention of

* In this and some other statements, allowance must be made for the authors want of acquaintance in the railroad engineering, which we believe is not his department. He appears, probably from this cause, somewhat bound upon these points. [ED. R. R. J.]

those interested in railway speculations, that the very large item of expenditure in the reports of the Liverpool and Manchester company, under the head of locomotive power account, varying from 30 to 40,000*l.* per annum, is, in part, the result of want of sufficient boiler room. In saying this, it is not meant that larger boilers than those at present in use by that company are at all practicable on their line of railway; and much less is it intended to cast the least reflection on any part of the direction, for there has been no lack of zeal in every one concerned in the management, to adopt every possible expedient that promised any chance of abatement under this head of disbursments; it is only mentioned to show the necessity of railway directors generally, attending more to this point. Science has, as yet, done little or nothing for them; indeed the common fault of railway directors is too great a tendency to adopt the suggestions of mere scientific gentlemen, or the schemes of amateur engineers, because their ideas happen to be clothed in a scientific dress, in preference to plain, practical, and inexpensive improvements of a less ostentatious character.

The numerous improvements of the ingenious Treasurer* of the Liverpool and Manchester company, apparently with a view to avoid the alternative of very large boilers and a reduced speed, and the many curious contrivances adopted from time to time to prevent the priming of the boilers, are proofs that those who have much experience in this matter, consider that in using larger boilers the remedy would be as bad as the evil it is proposed to cure; it is, therefore, now generally admitted that the profitable application of steam to *rapid* railway travelling, is yet surrounded with peculiar difficulties, all of which tend to the conclusion, that although the steam engine is an agent of almost unlimited capabilities, still it has, as yet, resisted all attempts to confine it as it were in a nut shell.

If the boilers are made larger and heavier, the destruction of the rails will be greater, besides the danger arising from the increased momentum of the engine in case of accident; on the other hand, if we work with smaller boilers we must have a higher pressure of steam, and then there is the greater destruction of the grate-bars and fire boxes, by the necessarily increased temperature of the furnace, which must render journeys of much greater length than thirty or forty miles with the same engine to be very uncertain and precarious, besides the danger and delay attending the continual giving way of the tubes. Again, if we attempt to use the steam at a moderate pressure, although fully equivalent to a reasonable speed, there is the constant liability of the water to prime over into the cylinders, from whence it is forced, by successive blows of the piston, through the funnel of the chimney, to the great detriment of the whole of the machinery, more particularly of the cranked axles, which, on this account, require to be of such enormous strength; in fact, when the engine primes, the piston is acting for some time like the ram of a powerful force pump or water engine, and the resulting effect must depend upon the acquired momentum or velocity of the engine at the time, and the strength of the parts. Any one may observe the effects of a locomotive engine priming, in a fine shower of spray from the top of the funnel, immediately on reaching the bottom of any considerable inclined plane, unless the speed is previously slackened or the regulator used with extreme care. Hence we may well doubt the

* H. Booth, Esq., of Liverpool, the inventor of the present form of locomotive boiler with numerous tubular flues, whose unremitting perseverance, combined with the united talent of the various able engineers and mechanics of the establishment, has rendered the locomotive engine, *as adapted to their own line* and their present arrangements, as to speed and passenger traffic, perhaps incapable of further improvement.

applicability of this engine to long lines of railway; the defect seems to lie in the *principle* which apparently involves the necessity of wire-drawing the steam, and is not to be easily removed by any mechanical arrangement whatever. In the locomotive engine, in its most improved state, the steam is in fact throttled at both ends—that is, both in the *induction* and *eduction* pipes.

Notwithstanding that the boilers of the locomotive engines on the Stockton and Darlington railway have been generally modifications of the old, or Trevithick plan, with a much greater capacity in proportion to the heating surface, than the multiflue boiler of Mr. Booth, and therefore, generally considered to be on a less economical principle as to the application of heat, it is well known, that the cost to the company for drawing each ton per mile on the level, is not one half of what it is upon the Liverpool and Manchester line. The fact is certainly not in favor of high speed and high pressure; the speed of the Darlington locomotives being about 12 to 15 miles an hour, which appears to be the velocity that gives the *maximum of useful effect*, while the pressure of the steam is only about 40 pounds on the square inch. And we have had an opportunity of ascertaining, from a long series of very careful experiments, that even this pressure is still higher than that which is found to produce the best possible effect in a stationary engine, when working without either governor or throttle valve, as is the case with locomotives.

The superior economy of the Durham engines, is, no doubt, in part, owing to the use of coal instead of coke, and not being compelled to burn their smoke, (as they are obliged to do on most of the Lancashire railways,) and this fact, it may be observed by the way, says nothing in favor of smoke-burning. It may also be stated, that but for the invention of the blast pipe, by Mr. Timothy Hackworth, which, in conjunction with Mr. Booth's boiler, at once doubled the efficiency of the locomotive engine, the prevention of smoke on railways would probably still present as great a difficulty as it yet does in factories.

While on this subject we may just state that the original "Sansparіel," of Mr. Hackworth, which all but successfully competed for the prize at the opening of the Manchester and Liverpool railway, may still be seen regularly working on the Bolton and Lehigh railway, apparently not much worse for seven years constant work, the boiler never having required any essential repair, while its contemporary rivals that have escaped the fate of the "scrap heap," have been re-made, and mended over and over again, since the celebrated race at Rainhill—a fact which goes far to prove that the principle of this engine has not been so very much improved upon, except that it is not so well calculated for burning coke as coal. The Sansparіel may frequently be seen at the Kenyon Junction, waiting for the Bolton trains from Liverpool, and plans of it may be seen in Dr. Lardner's work Heberts' Mechanics' Encyclopædia, Wood on railroad, Mechanics' Magazine, and many other works.

PRIMING OF FACTORY ENGINES.

The steam in a common factory boiler, for working an ordinary condensing engine in a factory, is usually of about two pounds per square inch greater pressure than the average pressure on the piston throughout the stroke, and with this condition, we have never found an instance of a boiler having much less than half a cubic yard for steam room per horse power, that was able to do its work properly. This proportion may be depended on, as the result of no very limited experience, being from actual personal

examination and measurement of several hundred boilers, with a view principally to the determination of this particular datum; and it fortunately happens, that the circumstance of a boiler priming into the cylinder, not only gives visible and audible signs of its taking place, but also leaves, in some measure, permanent traces of its having done so, sometimes in the cylinder, but almost always in the boiler, so that the accuracy of our experiments on this head may be easily tested.

Where the engine, or rather the boiler, is overworked, and the load on the engine not very regular, experiments to the foregoing effect may be said to be going on almost daily, and in many cases, even without the owner being aware of any thing of the kind, until his engine has been broken down a few times, and after the expenditure of a few hundred pounds: then (as it is commonly, but expressively, said in Lancashire) "*he finds it out.*" In fact, the want of sufficient capacity of steam chamber entails upon us the choice of two evils; one is the risk of breaking some part of the engine (generally the crank or crank pin) by a sudden flush of the water into the cylinder, the other is the constant tear and wear, and eventually the danger of bursting the boiler, by too great a pressure of steam.

Instances are sometimes met with, where double the above proportion of steam room is not sufficient to prevent the boiler from priming occasionally, but there is in such cases always some special circumstances to account for it; for instance, where there has been any neglect in cleaning the boiler, and a considerable portion of the load is suddenly thrown on, when the engine is already running at a good speed, and particularly if there is at the time a sharp fire under the boiler capable of suddenly generating a great quantity of steam. This, it will be perceived, is nearly a parallel case to that of a locomotive at the foot of an incline, as already mentioned. Cases of this kind frequently occur at calender houses, saw mills, and machine shops. In the latter it is rather disgraceful, because the managers of such places, if not engineers, ought, at least, to be experienced mechanics; but in Lancashire there are more than two or three such concerns which seem determined to verify the old saying, that "shoemakers wives go the worst shod." Mere neglect may be sometimes excusable, but there is too often sheer ignorrnce of the worst kind. Some of their proprietoss have for years been acknowledged as the first mechanics in Europe, and justly as they may lay claim to be so considered, from the magnitude of their establishments, it is painful to find that they have much to learn in respect of their engines and boilers.

The presence of some kinds of dirt in the water, particularly if it be of a mucilaginous nature, is liable to cause the engine to prime, whatever may be the amount of steam room. A small quantity of soap has a wonderful effect in this way; and generally speaking, with a dirty boiler and a full load on the engine, there is a *continual* "*flushing*" of the water in the boiler, or an *attempt* to "prime" at every stroke of the engine. In these cases we usually find that the dirt has partially left the boiler and passed into the cylinder, thereby seriously injuring the packing of the piston and valves, and causing an immense waste of tallow and fuel, besides requiring perhaps two engines to do the work of one. We know of nothing that has been so detrimental to, and so long delayed the successful introduction of Mr. Bartons metallic packing for pistons,—decidedly the most important improvement in the steam engine since the days of Watt.

For all such cases, however, there are various preventive remedies which will come more properly under our consideration in another chapter; the principal of which are the adoption of various mechanical me-

thods of frequently cleaning out the boilers, or rather of preventing them from becoming dirty. We shall now advert in particular to an apparatus, which effects the latter purpose very completely without the necessity of emptying the boiler, and without the least interruption of the continued working of the latter, or the engine to which it is attached. And we shall endeavor to do so here, at the unavoidable risk of being thought egotistical, the apparatus in question being partly contrived, or rather improved, and wholly adapted to its present purpose by the author of this work; not only because it has an important relation to the subject now in hand, namely, the priming of steam engines, but also because, since the publication of our first edition, we have had reason to believe that the apparatus is not so well known, ahd where known, not so well understood as we had previously supposed.—*Armstrong on Steam Boilers.*

ANTIQUITIES OF CENTRAL AMERICA.

The New York Albion furnishes a brief account of the important discoveries of Messrs. Stephens and Catherwood, in Central America, or Guatimala, as it was formerly called. Our readers are aware that the attention of the learned has been much directed, of late, to the numerous and astonishing monumental treasures that lie scattered about this vast region. The two gentlemen above named have recently returned from an extensive survey of these ruins, and are about presenting the result of their explorations to the public in a printed volume. In the mean time, in order to satisfy in some degree the public curiosity, they have delivered several lectures on the subject, the general conclusions of which are presented in the Albion.

The travellers proceeded from New York to the bay of Honduras, and, upon landing, their first halting place in the way of their task was *Copan* the ruins in the vicinity of which were both extensive and magnificent. Mr. Catherwood, on Wednesday evening, exhibited a drawing of a temple at *Copan*, which seems to have been upon an extensive scale, one front of it being in length about 230 feet, and its side face about 180 feet. The interior of the temple is laid out with all the skill and regard to convenience of the most practised architect, and the exterior presenting an elaboration of ornament as well as refinement in sculpture, which altogether astonished the travellers, as in fact so did the drawing astonish those before whom it was placed at the lecture. There were many single columns most elaborately wrought, the work was deeply cut, and all in masterly style.

From Copan the travellers proceeded to Kuirigui, where they found many monuments, chiefly of the same character as those at Copan, only the latter were much longer than those which were first visited. From thence they proceeded to Santa Cruz del Cuiche, to Guequetenango, to Ocosingo, to Palenque, and to Uxmal. The whole forming a circuit of nearly three thousand miles in perimeter, and the greater part of which was thickly studded with extensive ruins, all of which were analogous to each other, although the variations in extent, ornament, etc. were numerous. They were all evidently the labors of a people of a common origin, of apparently the same political, religious, and social principles, of the same habits and associations of ideas, and certainly far advanced in civilization and refinement. Innumerable square columns or obelisks of stone were found in the course of their investigations, all of which were carved on every side with hieroglyphics, or with figures of animals or human beings; the former, in all probability, containing legends which, if they

could be deciphered, would go far to explain the history of the people who had thus executed them; and the latter executed with such regard to the due proportion of figure as actually to astonish the travellers, who had not the most remote expectations to find any branch of the fine arts in so forward a state. What added to their astonishment was the fact that all these monuments were found in the deepest recesses of forests of gigantic and closely planted trees; a proof of their antiquity altogether irreiragable, as it must have required centuries to bring such trees to their maturity and enormous growth, and it must have been after those cities were ruined and gone to destruction that those forests were allowed to take root in their precincts at all. These considerations, unaided by any other, must carry the mind back to a period of the world altogether startling to think of.

An erroneous notion has got abroad that these antiquities, in the colossal magnitude of their parts, throw those of Thebes, Luxor, and other Egyptian monuments in the shade, and that the latter may now "hide their diminished heads;" it is believed also that in architectural elegance, as well as in extent, these American remains far exceed those of Balbee, Palmyra, or even ancient Babylon itself. These surmises receive no countenance from the accounts given by Messrs. Stephens and Catherwood. The extent of the American monuments has rather regard to them as one mass promiscuously and almost everywhere spread within a circumference of three thousand miles, than to the extent or magnitude of any one specimen or set of ruins; and nothing but either a complete misunderstanding of the true details, or an intense love of the marvellous, could have brought about those false comparisons.

But the most important point to be ascertained is that of referring these monuments truly to any of those of the old world. At the first glance at some of the more colossal figures, their costumes and their groupings, there was for the moment a similarity to those of ancient Egypt, but the practised eyes of our travellers soon corrected the momentary error of their thoughts. There was not one of those monstrous heads which so essentially belong to Egyptian mythology, religious rights, and occult writings; the proportions of the figures were in every respect better in those before them, and nowhere did they find that inherent regard for great magnitude or peculiar position in the statuary and sculpture. The hieroglyphics too, though liberally scattered and everywhere homogenous, were altogether different from those upon the Egyptian monuments. From the intricacy of their designs, and from many grotesque subjects of their sculpture, these monuments might be referred to a more oriental source than that of Egypt; and the similarity seems to increase the further they are referred to the eastward. China and Japan present many of the images and groups which are found on the American monuments; and although with much that is grotesque, in the latter there is also much that is beautiful and symmetrically correct, while in China and Japan, particularly the latter, the monstrous prevails in an exorbitant degree, there is really much that is common to the east of Asia, and to the west of America.

With data like those before us, then the editor of the Albion asks, can there be much difficulty in fortifying that most received hypothesis, that America was first peopled from the eastern part of Asia, the passage being made across Behring's straits? Where is the difficulty in assuming the theory that mankind, continually radiating from the primitive seats of first creation, and continually advancing beyond previous confines, should gradually arrive at the western shores of the Pacific, should people the

islands there, should cross the narrow straits—so narrow that at midway both shores may be seen from the same position--should travel southward, and give a human population to this continent?

The following extract is from a paper entitled, Brief Observations on the State of the Arts in Italy, etc., by Chas. H. Wilson, Architect, Edinburgh; read before the Soc. of Arts in Scotland. Many good things are to be found in this paper which is, however, too long for insertion. We shall content ourselves with a few other extracts.

STATE OF ENGINEERING IN ITALY.

I shall now turn to the engineering works of Italy, a subject worthy of much attention, but on which, I regret to say, I am able to say very little indeed. The greatest works I saw going on were those at Tivoli, and from the Ombrone to the Lake of Castiglione in the Tuscam Maremma. I shall merely offer a very brief description of these works, necessarily very imperfect, as I write entirely from memory. The Tiber or Aniene, on reaching Tivoli, was dammed up by the architect Bernini; precipitating itself over the lofty barrier he raised, it disappeared under the rocks on which the town is built, and was seen again in the celebrated grotto of Neptune; rushing out of this remarkable cavern, it fell into another abyss, and again vanished into the grotto of the Sirens, from whence it issued in the deep valley under Tivoli, several hundred feet below its original level. The pencils of the painters of every nation have been employed for centuries with this, I may say, terrible scenery, this *orrido bello* of the falls of Tivoli. They may now depict the rocks, but the waters are gone for ever. Some years ago, Bernini's dam was carried away in a flood: it was rebuilt by the Pope's engineers; but, if I remember aright, the river got the better of them, and threw down their work; at last they dammed up old Tiber, and made the very ugliest waterfall that ever unfortunate artist contemplated. It was discovered that the river, in passing through Neptune's grotto, had worn away the rocks in such a manner that the town and its temple depended on a rugged pillar, the duration of which could not be calculated upon. To prevent the town paying a visit to the Sirens beneath, it was resolved to turn the river, and it will be acknowledged that this was a bold undertaking; walled in by mountains, it sought a passage under them; and to a certain extent imitating the operations of nature, the engineers have carried the river through two parallel tunnels, and tumbled it into the valley beyond the Sirens' grotto, over a bank twice or perhaps three times as high as the Calton hill. I have made a plan from memory of this operation, as the best mode of explaining it. The engineers have saved Tivoli, but its romantic beauty, as far as the river is concerned, is gone for ever.

The other engineering work which I mentioned, namely the canal from the Ombrone to the lake of Castiglione, has excited much interest. The lake of Castiglione, anciently the Lacus Prilis, falling very low in summer, left much marshy ground uncovered, in which were numerous stagnant pools, and quantities of putrid herbage, making the air poisonous in hot weather, and breeding myriads of noxious insects. To remedy these evils, Leopold 1st ordered the architect Ximenes to make a canal from the river Ombrone to the lake; by this means it was intended to keep the latter constantly at the same level. This work was finally executed by the present Grand Duke in the year 1830, and by means of a canal 7 miles long and 25 feet broad, a sufficiency of water is supplied to keep the lake

at a proper level; so sufficient indeed was the supply, that the whole surrounding country was overflowed the first year; but this has been remedied. The air, it is said, has been improved; but when I visited Castiglione in 1832, I found that all who could, left it in the summer months, and all who remained had the fever. Some notice may be expected from one of the engineering works in the Pontine Marshes; but like other British travellers, I have only galloped through them, and have merely to state that the attempts to drain them cost a million of money.

The roads in the north of Italy are excellent, and indeed generally throughout the peninsula. Although a small portion comparatively of the country is intersected by roads, I have travelled many miles over turf, or by small tracks on the coast or on the mountains. Towns are almost universally built on eminences; consequently the roads are hilly, but I think less so than would be supposed from the nature of the country, and both in direction and in smoothness they greatly excel those of France.

The system of road making followed, is nearly the same as that adopted by the late Mr. Telford, that is to say, a pavement of stones is first formed, upon which the metal is laid;* but I do not think that the principles advocated by our great engineer are followed out in the formation of the pavement. Excellent roads, however, are the result of the system, even although gravel is used instead of broken metal.

Various principles of paving are now exciting much attention in London; it is to be regretted that something like a sensible principle is not followed in Edinburgh. In Italy various modes are adopted; in Genoa and at Naples large flat parallelograms of lava are used; at Florence, large irregular polygons carefully jointed; and at Rome, a pavement resembling our own, except that the stones are of regular forms, of one size, and grouted in with lime and pozzolana.

ANTHRACITE COAL FIELDS—THEIR OUTLETS, ETC.

Mr. Editor:—It may be interesting to many of your readers to know the extent of the Anthracite coal measures in acres. In preparing the following table, I have excluded all the conglomerate ridges which surround the different deposits of coal. Not being acquainted with the boundaries of the third great, or Wilkesbarre basin, and some of the small deposits north of Hazleton, I leave them to be supplied by others.

The first great, or Schuylkill coal basin, contains 67,000 acres, having the outlets to market as follows:

	Acres,
By the Lehigh canal,	3,750
By the little Shuylkill railroad to Port Clinton, thence by Schuylkill canal or Reading railroad,	6,325
By Pottsville and Schuylkill Haven, thence by Schuylkill canal of Reading railroad,	31,875
A railroad six and a half miles in length will connect the Goodspring creek with the Mine Hill and Schuylkill Haven railroad, seven miles from Schuylkill Haven, and will make an outlet to market, either by the Schuylkill or by the Union canal, for	6,250

* I have not seen the railroad which has been lately made from Naples to Castellamare, but am well acquainted with the line; a novel question in engineering must arise in considering how it is to be protected from the lava of Vesuvius. This I believe will not be very difficult, but it has a more insidious enemy in the earthquake, and a more overwhelming one in the showers of scoriæ and ashes which accompany an eruption.

Railways may be useful in Italy to promote her commercial prosperity, but I pity the man who could think of travelling in such a manner through any part of that country.

By the Pinegrove, and thence by the Union canal,	13,500
By the Wisconisco railroad and canal,	5,800

The second great or Shamokin and Mahonoy coal field contains 59,450 acres, having the following outlets to market:

By the Lehigh canal, or by the Schuylkill, via the little Schuylkill,	4,700
By the Schuylkill, via the Danville and Pottsville railroad, or by the same railroad to Sunbury and the Susquehanna,	21,000
By the Danville and Pottsville railroad to Sunbury, (the Shamokin part of the basin,)	33,750
The Beaver Meadow coal basin,	11,350
The Hazleton basin,	12,500
Having their outlet to market by the Lehigh canal,	
The Broad Mountain coal basin, north of the Mine Hill, generally considered a part of the Schuylkill basin,	8,450
The Broad Mountain Summit basin,	2,225

Having their outlet to market by the Schuylkill, via Pottsville and Schuylkill Haven.

SAMUEL B. FISHER.

Pottsville, March 29, 1841.

From this communication, it appears that the above mentioned basins contain, in the aggregate, 155,220 acres of Anthracite coal lands, which have their natural outlets as follows:

By the Schuylkill, including the 6,220 acres on Good Spring creek,	72,225
By the Lehigh,	29,950
Shamokin, via Sunbury,	33,750
Pinegrove, by Union canal,	13,500
Wisconisc feoeder and railroad,	5,800
	155,220

Pottsville Miner's Journal.

DUTTON'S MODEL OF A BRIDGE.

MR. EDITOR:—Allow me, through the medium of your paper, to call the attention, particularly of the county commissioners and the board of control, to two models of bridges, invented by our countryman and citizen, Mr. I. L. Dutton, No. 25 Pine street. The want of a bridge at Fairmount drew his attention to this subject, and either of these bridges is admirably adapted to that location. One of them is an improved suspension bridge; the other, on the principle of the patent lever self-sustaining arch. Yet both are constructed on an entirely new combination of principle, and for their great streagth and economy, are worthy the attention of the contractors, and the public generally, who are also secondarily interested. These models will be placed in the saloon of the Exchange on Thursday, where the public will have an opportunity of being gratified with a view of their symmetry and beauty.

There will also be exhibited, at the same time and place, an improved plan of a safety car, the invention of the same gentleman, and well worthy the inspection of the scientific, the railroad companies, and the public at large, all of whom are interested in any improvement that will secure safety

to the traveller, and to the contractor economy, as it will cause at least one half less wear and friction than that constructed on the present plan.

A FRIEND TO PUBLIC IMPROVEMENT.

We have seen the model to which our correspondent refers, and trust that those interested in the erection of a bridge at Fairmount will make themselves acquainted with the principles of Mr. Dutton's invention, and ascertain its applicability to the circumstances of the site. It struck us that the plan was good, combining great strength with all convenience and means of ornament. Still, in so important a subject, it would be well that men skilled in mechanics should carefully examine the model, and as far as possible, test its worth. The model of the bridge for Fairmount is to a scale of half an inch to a foot, and, though constructed of light materials, is by their judicious combination, of great strength.

NEW ROUTE.—The steamer Vermillion arrived at Buffalo a few days since, had among her large cargo, forty hogsheads of Ohio Tobacco destined for the Baltimore market. The Buffalo Journal says "it is a long journey, via Buffalo and the Erie Canal, yet the most speedy and economical route that can be obtained for produce that is seeking a market."

We lay items of this description before our readers to show the importance of our works of internal improvement. Our city is now the great shipping port for much the largest portion of our country, but it can only be so for a part of the year after the completion of the railroad from Albany to Boston, unless the New York and Albany and the New York and Erie railroads are constructed.—*Times and Star.*

A recent report to the Russian Government contains an account of the Chinese library, which forms part of the Asiatic Museum of the Imperial Academy of Sciences at St. Petersburg. This library was founded in 1730, at which period the Russian resident at the court of Pekin, sent by the emperor Peter I, transmitted several Chinese works. Since that period the collection has been constantly increased by contributions, either from envoys or by purchase; and a catalogue has been regularly made. The last addition was from the purchase of the rich collection of Chinese works of Baron Schilling de Canstadt, through the munificence of the Emperor. M. Brosset, the librarian, has lately classed all the works, and composed a new catalogue. This library, which is second only to that of Paris, contains 1,364 volumes bound, rnd 11,510 unbound. Among them are a general statistical account of China, in 300 unbound volumes, and a general history of the Chinese Empire, from the most remote period down to the present age.

SPOTS ON THE SUN.—A correspondent of the Boston Daily Mail, says that "with one of my large diverging telescopes five distinct clusters of dark spots on the sun may now be seen, May 5th, the two clusters near the centre of the sun extend upwards of fifty thousand miles in length by about twenty thousand breadth; they will be visible a few days longer if the atmosphere is clear; the abve perhaps may account for the cold weather backward spring we have had. We do not know that any body in this part of the country has found an opportunity of looking at the sun long enough to ascertain whether it had spots upon it. Nor do we know that these spots would be a sufficient cause foa the cold weather of this spring. We remember however that in the year 1816, the summer was so wet and cold that corn unless in particular spots did not ripen; and then the spots on the sun ware so large that they were, toward sundown visible to the naked eye. *U. S. Gaz.*